

TECHNICAL NOTE

TN - 50

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ROTREE Spot Cultivator - New Zealand Update

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Figure 1 - Top, ROTREE working in pinus radiata cutover. Bottom, ROTREE mound excavated to show cultivation profile

Introduction

In March, 1998 an excavator-mounted ROTREE spot cultivator was trialled in New Zealand. The machine was studied for 2 days working in Kaingaroa forest. This Technical Note is a summary of the trial results. The ROTREE is designed to create individual planting mounds over deep cultivation.

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Results

The ROTREE averaged a production rate of 3.9 spots per minute (range 3.6 to 6.4). When the site was free of logging residue and slash clearing was not required, the ROTREE had higher rates of production. During the study activity sampling of the operation was also carried out (Table 1).

Table 1 - Activity sampling results

Activity	% of total time
Walk	12.6
Sweep slash	17.2
Mound	56.7
Slew	13.5

The ROTREE spent over half its time creating mounds and a further 25% moving between mounding positions. If slash was less heavy, then the 17% of the time spent clearing slash would reduce, with two-thirds of any gain going to mounding and one-third to moving.

Costs (at 833 spots/ha) were estimated to be \$330 per hectare. The machine costing was derived using Liro's standard costing procedure. (Riddle 1994).

Soil Cultivation

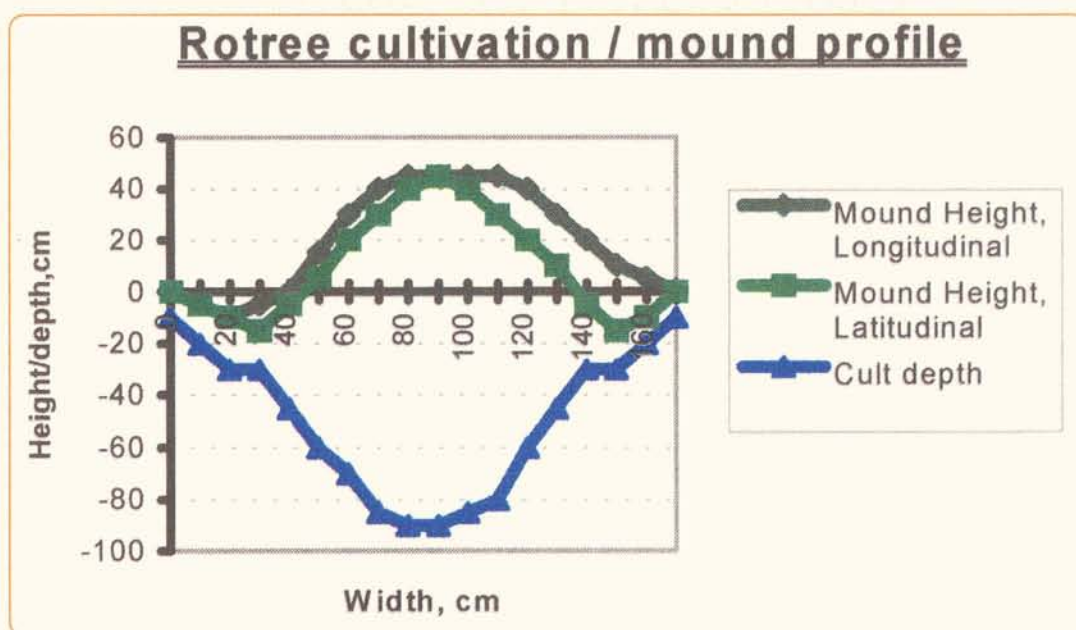


Figure 2 - ROTREE cultivation / mound profiles

Cultivated soil volume per mound

Above ground	0.37 m ³ (37%)
Below ground	0.64 m ³ (63%)
Total	1.01 m ³

The ROTREE was creating more cultivated volume (20%) than it did in previous studies conducted by Liro (Hall, Jamieson and Byatt, 1997).

The type of soil in the mound at planting depth was assessed for 50 spots (Table 2) by determining whether the tree would be planted in topsoil, subsoil, mineral soil or a mix of soil. The ROTREE had 96% of its trees being planted in either topsoil or a mix of topsoil or subsoil.

Table 2 - Soil type at planting depth

Soil Type	Percent
Top-soil	42%
Top/sub-soil	54%
Sub-soil	2%
Sub/mineral soil	0%
Mineral soil	0%

Soil disturbance on the site was assessed before and after treatment. The operation created no extra heavy soil disturbance (Table 3). Post-treatment there was less moderate, light and nil disturbance, with this area being taken up with the mounds (10% of the area).

Table 3 - Soil Disturbance (%)

	Heavy	Moderate	Light	Nil	Mound	Slash + Light	Slash
Pre-treatment	9	13	31	10	-	28	9
Post-Treatment	9	10	26	7	10	30	8

The ROTREE has the ability to work down through the lighter slash. Pushing slash aside, which is time consuming, is only required in areas of dense slash. Slash levels on this site (Table 4) were typical of radiata pine cutovers in New Zealand.

Table 4 - Slash (logging residue) Volume, m³/ha

	Stem	Branch	Total
Pre-treatment	13.5	29.0	42.5
Post-treatment	Volume unchanged, distribution largely unchanged		

The height of the mounds above the uncultivated soil surrounding the mound was 40cm (Table 5) and 32cm above the surrounding slash.

Table 5 - Cultivation/mound height

Average cultivation depth	82 cm
Average mound height (soil)	40 cm
Average mound height (slash)	32 cm

The majority of the rejections in the quality assessment of the mounds created by the ROTREE (Table 6) were due to insufficient mound height, the rest were deemed to be unplantable due to unacceptably high levels of slash in the mounds. Spacing of spots by the operator was very accurate and well within acceptable limits.

Table 6 - Quality Assessment (150 mounds)

Accept	94%
Reject	6%

Mound Strength/Weathering

A series of mounds were measured, looking only at mound height. These were remeasured after planting to determine mound settling:

mound heights at cultivation - 40 cm

mound heights post planting/weathering - 30 cm (5 months after mounding)

Summary

The ROTREE cost \$330 per ha to create 833 spots/ha. This is likely to change on clear sites, with the ROTREE able to work more quickly and thereby reducing the per hectare cost. If the ROTREE was working consistently at 6 spots per minute, which it would be capable of on clear sites, the per hectare cost could be as low as \$260 per hectare.

The ROTREE is able to work down through the slash to a large extent, and leaves the site relatively undisturbed in terms of slash redistribution and soil disturbance outside the mounds. This could be positive on some sites as some literature on micro-site effects on tree growth suggest that wind is a significant negative factor in early growth on exposed sites, and that the slash can have a sheltering effect.

References

- Hall P. Jamieson D. and Byatt. N. (1997): The ROTREE Spot Cultivator-moulder. LIRO Report Vol. 22, No. 1.
- Riddle A. C. (1994): Business management for logging contractors. LIRO Handbook.

Acknowledgments

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The costs stated in this report were derived using the procedures shown in the Liro Limited Handbook, Business Management for logging. They are indicative only and do not necessarily represent the actual cost of the operation.
